AIR CIRCUIT CYL & PIPELINE INSTALLATION FOR MACHINES WITH E-Z PLUMB PIPING

INSTALLATION PROCEDURE

1. Turn the System Power switch to ON and disconnect all pipeline hoses.
2. Close all cylinder valves except the O_2 cylinder valve.
3. Set the oxygen flow rate to 5 l/min.
4. Open the N_2O flow control valve to drain pressure from the system.
5. Close the O_2 cylinder valve, and close the flow control valves. Press the O_2 FLUSH button to drain oxygen pressure from the system.
6. Turn the System Power switch to STANDBY and remove AC power from the machine.
7. Remove the screws securing the table top, and remove the top.
8. Remove the flowmeter housing back cover.
9. Remove the vapor box front cover.
10. Remove the O_2 flow control knob, and remove the knob guard.
11. Remove the flowmeter shield.
12. Disconnect all of the copper tube connections at the back of the flowmeter top block assembly.
13. Carefully remove all flowtubes from the flowmeter housing (ref. Figure 5).

INSTALLATION PROCEDURE (continued)

14. From the rear of the flowmeter assembly, remove the three screws securing the 2-gas flowmeter top block to the flowmeter assembly, and remove the top block.

15. Assemble the air flowmeter insert, O-rings and valve as shown in Figure 1. Thread the flowmeter insert into the bottom flowmeter block.

16. Place a drop of red Loctite #271 on the threads and install a straight fitting (P/N 4109408) in the back of the flowmeter insert.

17. Attach the two spacers (P/N 4111947) to the flowmeter channel with 6-32 x ⅜ in. flat head screws as shown in Figure 1.

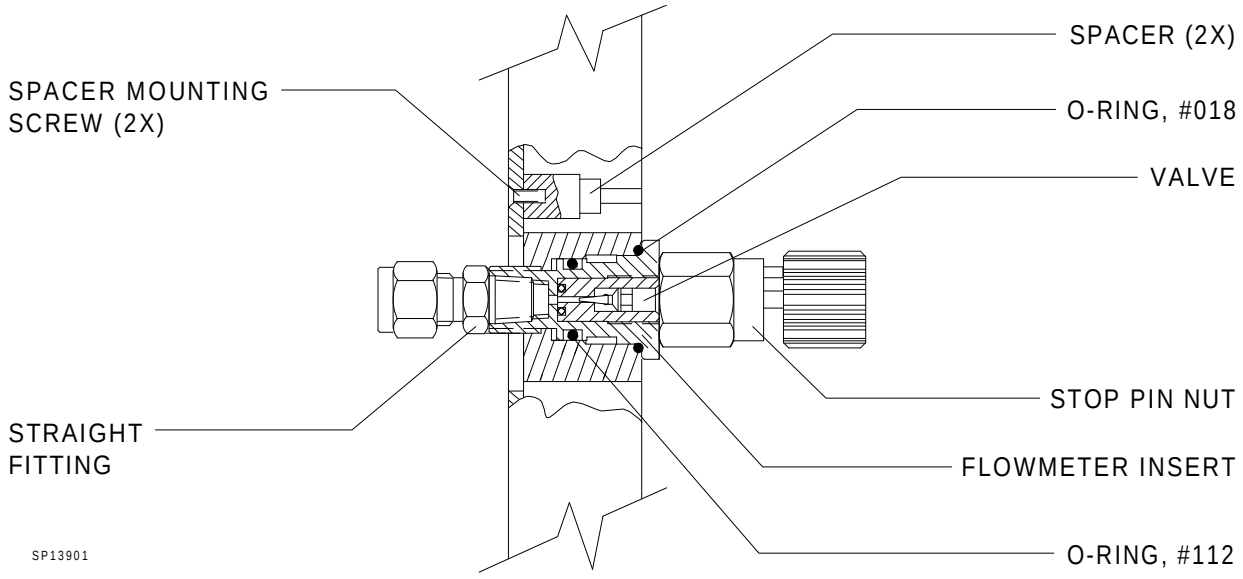


Figure 1: FLOW CONTROL INSERT AND VALVE INSTALLATION

INSTALLATION PROCEDURE (continued)

18. Install six upper flow tube retainers (connector assemblies P/N 4102506) into the 3-gas top flowmeter block (P/N 4112302). Apply Dow Corning High Vacuum Grease to the O-rings on the retainers. See Figure 2.

19. Place a drop of red Loctite #271 on the threads and install a set screw in each end of the top flowmeter block.

20. Place a drop of red Loctite #271 on the threads and install a straight fitting (P/N 4109408) in the block at the locations shown in Figure 2.

21. Place a drop of red Loctite #271 on the threads and install a plug (P/N 4105382) in the block at the location shown in Figure 2.

22. Remove the nut and ferrules from the straight fitting, and install the top block assembly in the flowmeter housing with the screws and lock washers that previously secured the 2-gas flowmeter block.

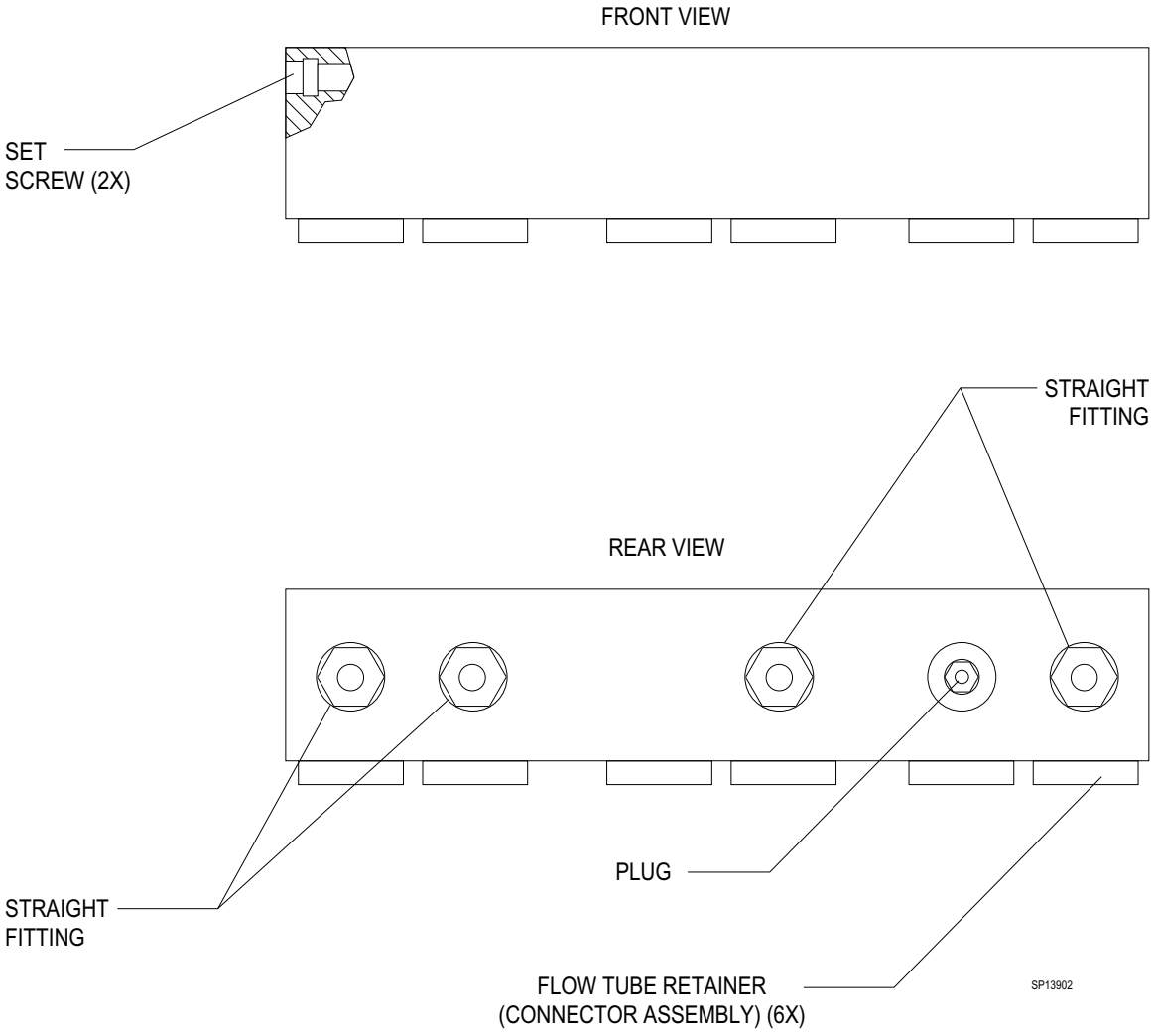


Figure 2: THREE-GAS TOP BLOCK ASSEMBLY

INSTALLATION PROCEDURE (continued)

23. Place a drop of red Loctite #271 on the threads and install a straight fitting (P/N 4109408) in the bottom flowmeter block at the location shown in Figure 3.

24. Install copper tube (P/N 4112098) into the fitting at the back of the flowmeter insert and install two yellow AIR labels (P/N 4109872) at the locations shown in Figure 3.

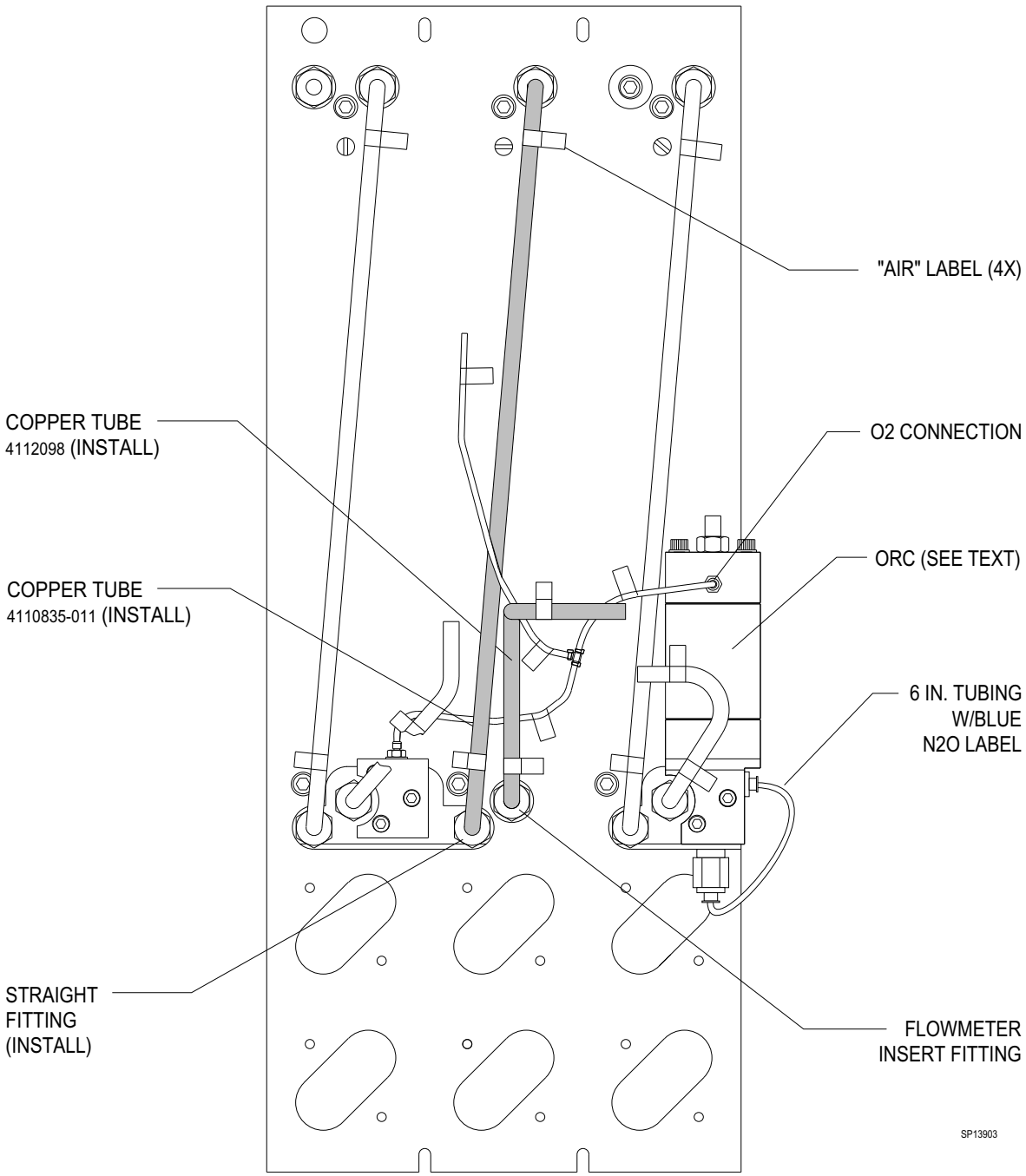


Figure 3: COPPER TUBING INSTALLATION

INSTALLATION PROCEDURE (continued)

NOTE: Skip the next six steps if the machine is equipped with a later design ORC (P/N 4113229) having the 6 in. N_2O bypass line as shown in Figure 3.

25. Disconnect the O_2 line from the existing ORC.

26. Remove the existing ORC from the flowmeter assembly.

27. Install a 6 in. length of tubing with a blue N_2O label on the new ORC, and secure each connection with a press-on hose clamp.

28. Install the new ORC on the flowmeter assembly. Ensure that the O-rings are correctly in place.

29. Attach the O_2 line to the O_2 connection on the new ORC, and secure the connection with a press-on hose clamp.

30. Remove the flow restrictor from the right side port of the 4-way fitting (as viewed from the back of the flowmeter housing), and replace it with restrictor P/N 4110738-007 (brown). See Figure 8.

INSTALLATION PROCEDURE (continued)

31. Install copper tube (P/N 4110835-011) connecting the top and bottom flowmeter blocks, and install two yellow AIR labels at locations shown in Figure 3.

32. Place a drop of red Loctite #271 on the threads and install a ⅛ in. NPT coupling (P/N 4103668) on the pipeline pressure gauge (P/N 4110575-001).

33. Place a drop of red Loctite #271 on the threads and install a hose barb fitting on the other end of the coupling.

34. Install a 9 in. length of flex tubing (ML08003) on the hose barb and secure it with a press-on hose clamp (P/N 4104161).

35. Place a drop of red Loctite #271 on the threads and install a 3/16 tube straight fitting (P/N 4109402) on the cylinder pressure gauge (P/N 4110575-002).

36. Place the pipeline pressure gauge in the top center position and secure it with two nuts (P/N HW55002) as shown in Figure 4.

37. Place the cylinder pressure gauge in the bottom center position and secure it with two nuts (P/N HW55002) as shown in Figure 4.

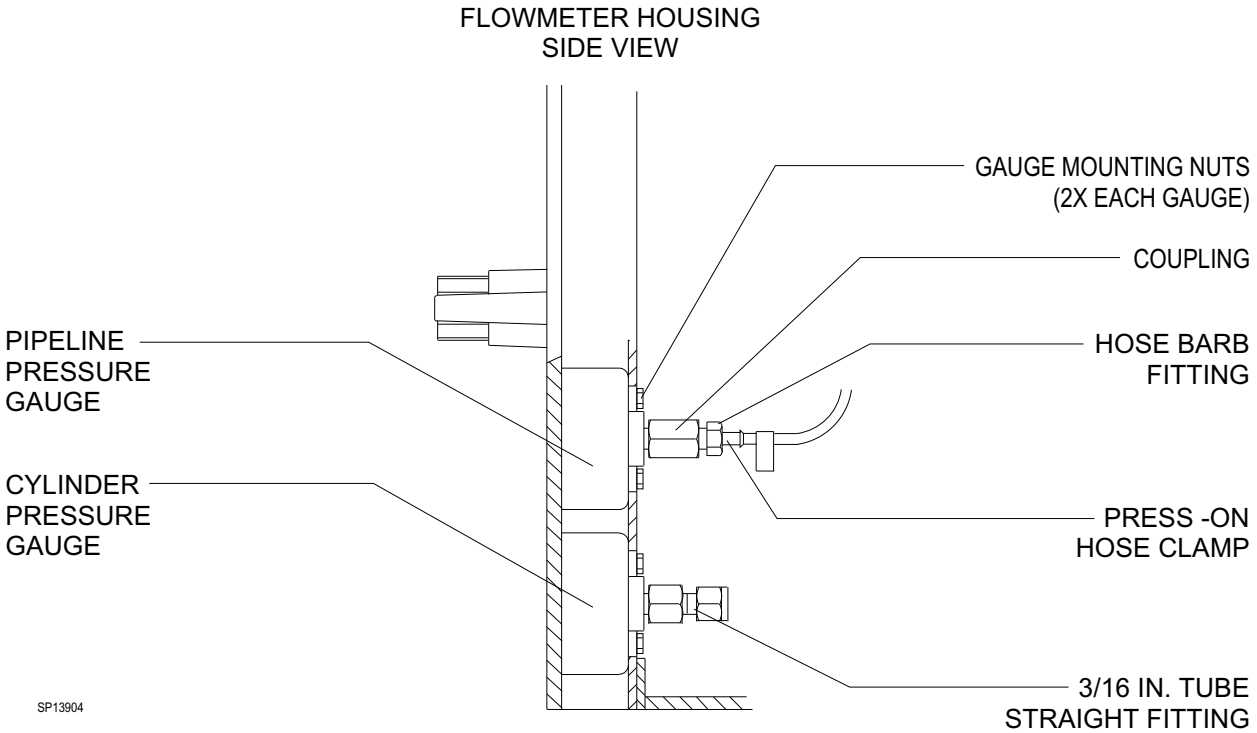


Figure 4: GAUGE INSTALLATION

INSTALLATION PROCEDURE (continued)

38. Insert large gaskets (P/N 4102724) into all the flow tube retainers in the top flowmeter block. (Transfer gaskets from the 2-gas flowmeter block that was removed from the machine.) Insert large gaskets in the center positions of the bottom flowmeter block.

39. Install the flow tubes in their correct positions (fine tubes to the left) and ensure that each tube has a ball.

    For those tubes seated in a restrictor housing, be sure that the arrangement of the restrictor and its gaskets is correct.

40. Ensure that the markings on each flow tube are facing forward, and turn the upper retainer screw (see Figure 5) until the flow tube is held firmly in place.

CAUTION: Do not over-tighten the screw as the flow tube may break.

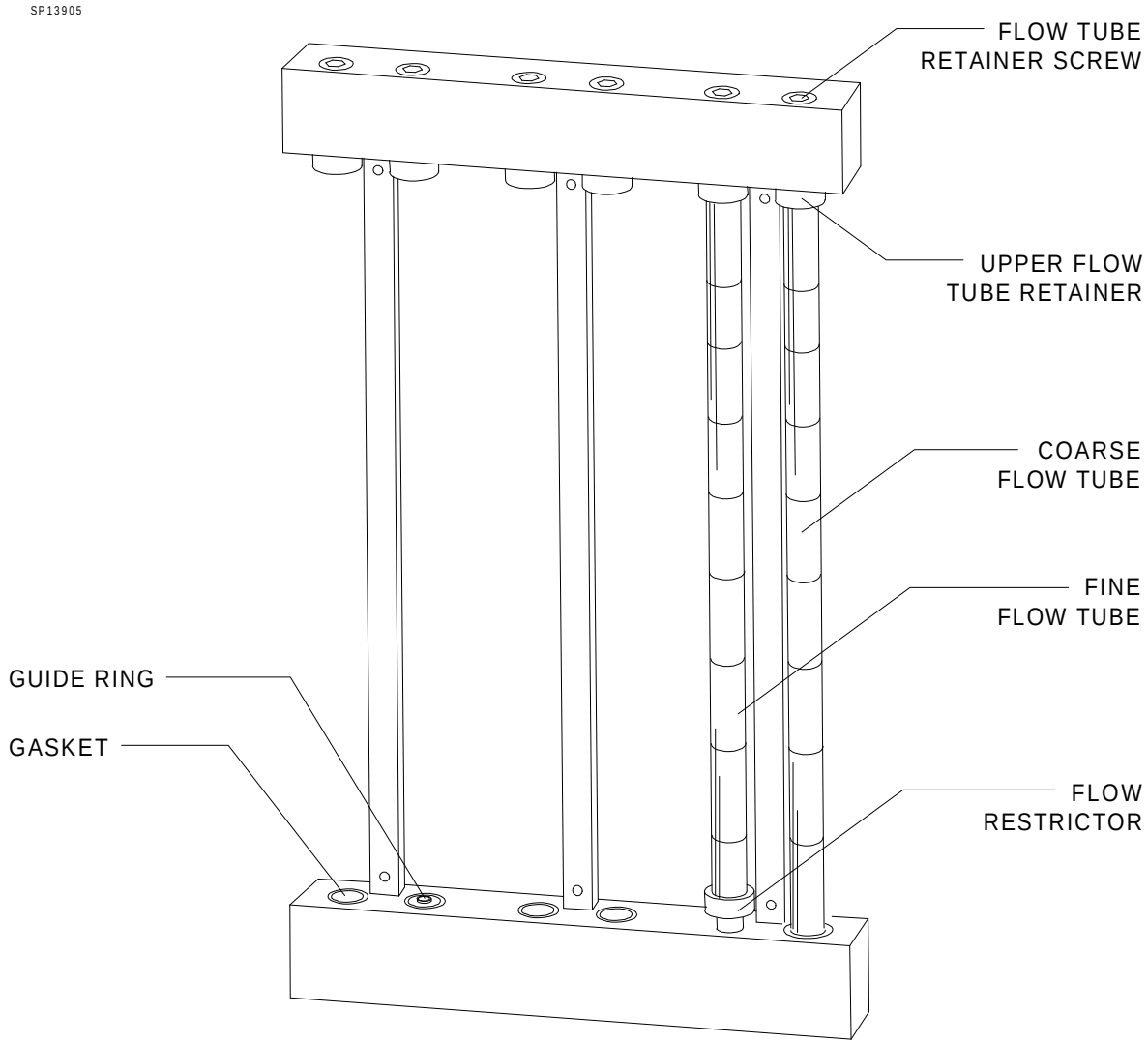


Figure 5: FLOW TUBE INSTALLATION (TYP)

INSTALLATION PROCEDURE (continued)

41. Install an Air DISS inlet assembly (P/N 4109412) as shown in Figure 6, with a ⅝ in. int-t lock washer (P/N HW67001) and ⅝-18 nut (P/N HW52002). Orient the assembly at the same 70° angle as the other pipeline inlets.

42. Place a drop of red Loctite #271 on the threads and install the pipeline filter (P/N 4106198) into the inlet assembly.

43. Place a drop of red Loctite #271 on the threads and install the tee fitting (P/N 4102760) into the filter as shown in Figure 6.

44. Place a drop of red Loctite #271 on the threads and install a hose barb fitting (P/N 4111771) in the center port of the tee fitting as shown in Figure 6.

45. Place a drop of red Loctite #271 on the threads and install a straight fitting (P/N 4109408) in the remaining port of the tee fitting.

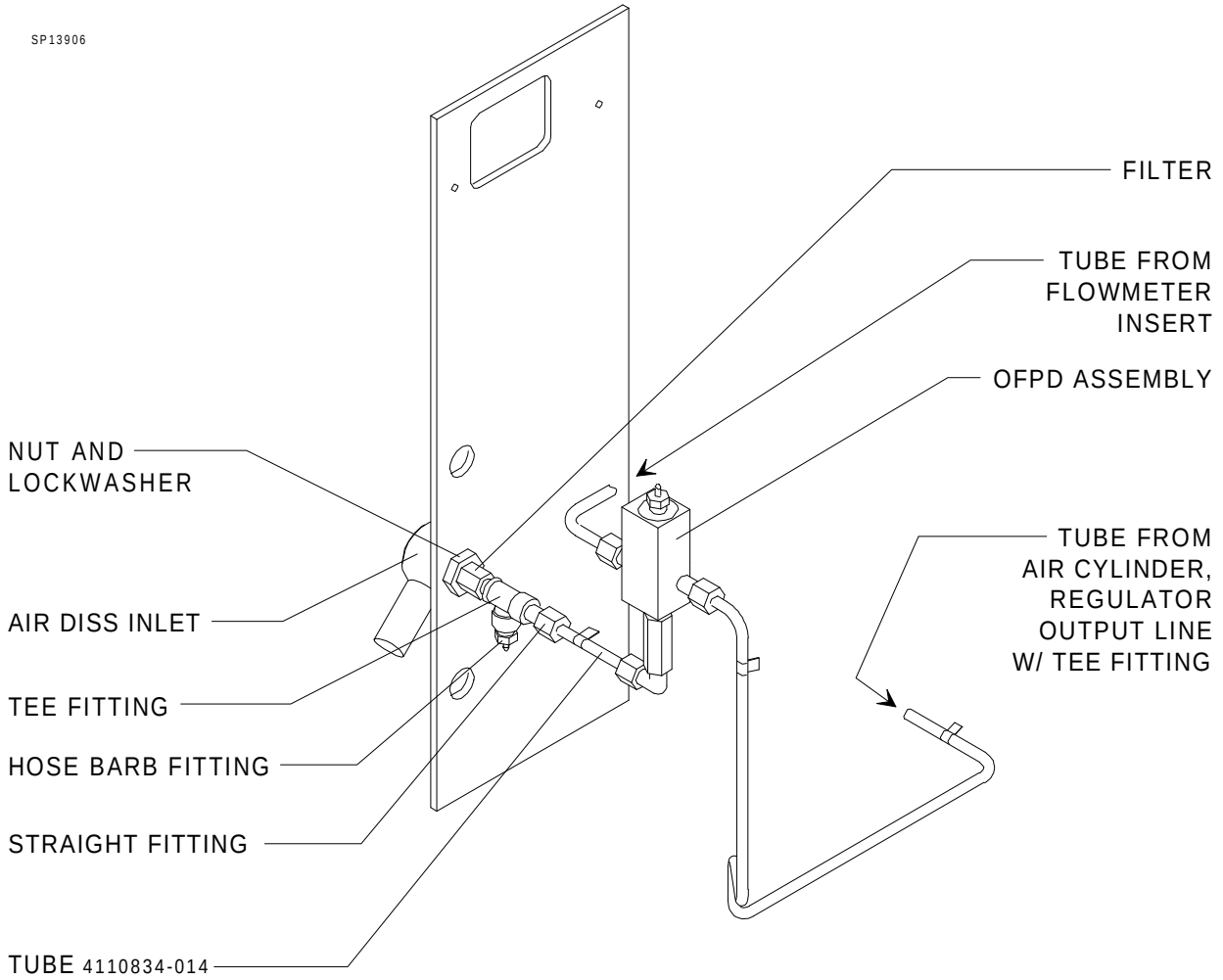


Figure 6: OFPD INSTALLATION

INSTALLATION PROCEDURE (continued)

46. Install copper tube (P/N 4110834-014) between the straight fitting and the bottom elbow on the OFPD assembly. Install a yellow AIR label on the tube.

47. Connect the copper tube from the Air flowmeter insert (previously installed) to the side port on the OFPD assembly. See Figure 6.

48. Install the air cylinder regulator assembly (P/N 4104603) with two 10-32 x ½ in. set screws (P/N HW10001). Orient the regulator as shown in Figure 7 with the Inlet marking toward the front of the machine. Tighten the mounting screws to a torque of 55 in. lbs.

49. Attach the copper tube (P/N 4110837-015) to the outlet port on the regulator as shown in Figure 7. Install a yellow AIR label at each end of this tube.

50. Install a tee fitting (P/N 4108636) at the other end of this tube, and install a plug (P/N 4103072) in the center port of the tee fitting.

51. Connect the copper tube (P/N 4112089) between the remaining port on the tee fitting and the remaining side port on the OFPD. See Figures 6 and 7. Install a yellow AIR label at each end of this tube. Tie strap the tube to the O_2 line as shown in Figure 7.

52. Install the Air yoke assembly (P/N 1101645) on the rear of the machine (remove the existing screw and nut from the frame rail) with two 5/16-24 x 1¾ in. socket head screws (P/N HW01058) and lock washers (P/N HW65005). Ensure that the yoke has a yellow AIR label.

53. Connect the 3/16 in. dia. tube (P/N 4104215) between the Air regulator inlet and the yoke check valve. Install a yellow AIR label at each end of this tube.

54. Connect the 3/16 in. dia. tube (P/N 4104214) between the side HP port on the regulator and the cylinder pressure gauge. See Figures 7 and 4. Install a yellow AIR label at each end of this tube.

INSTALLATION PROCEDURE (continued)

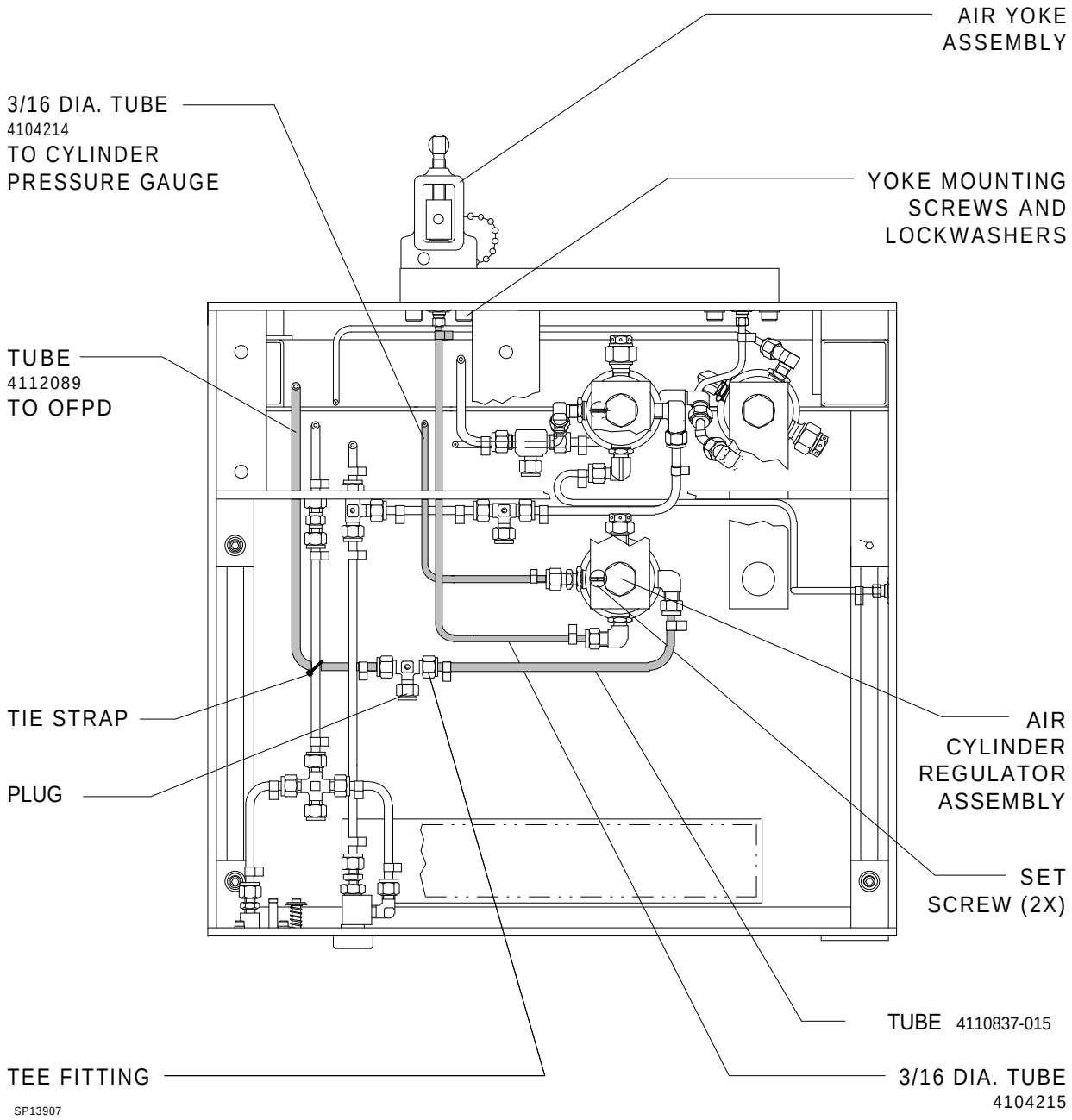
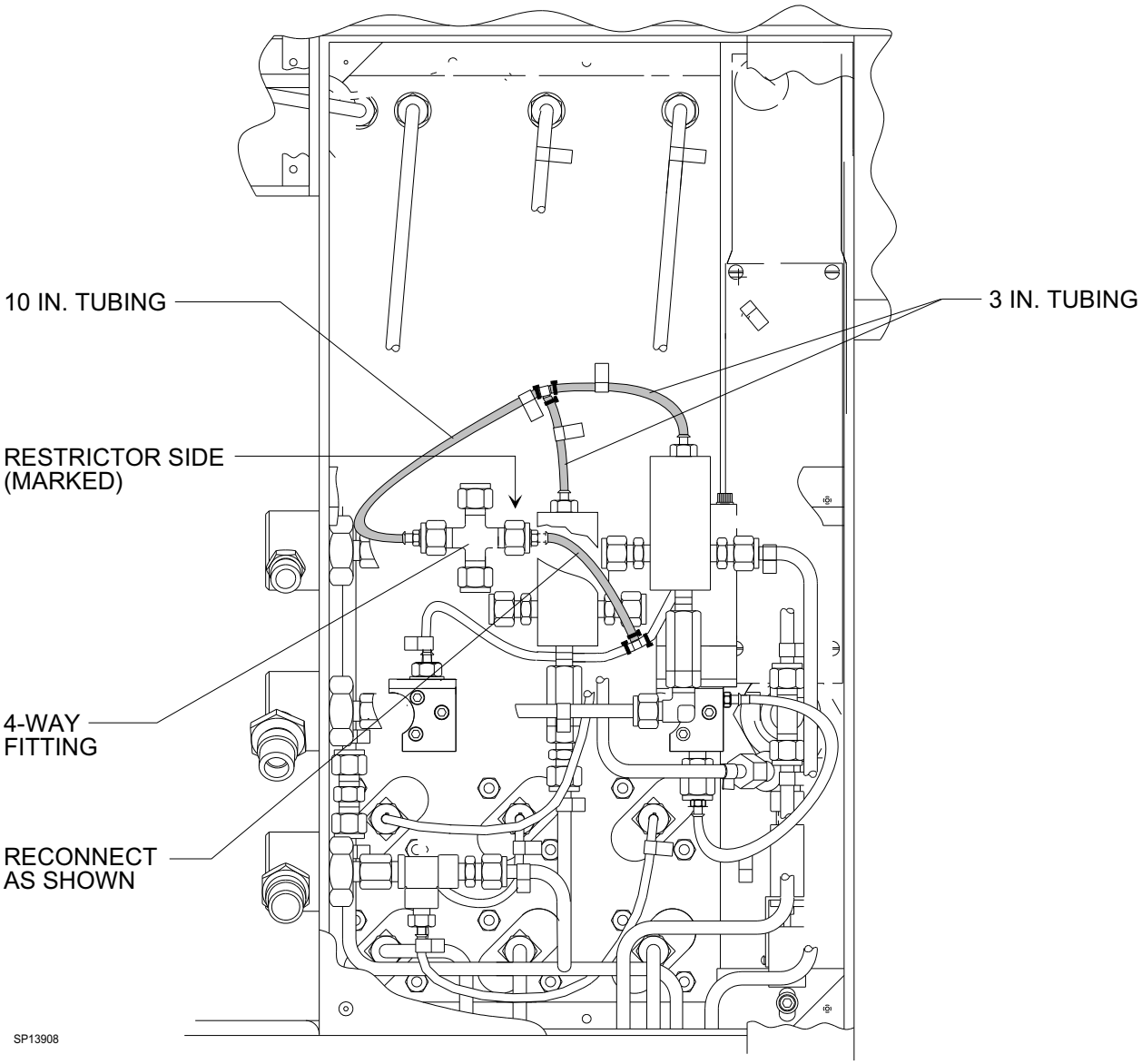


Figure 7: AIR YOKE, REGULATOR AND TUBING INSTALLATION

INSTALLATION PROCEDURE (continued)



REAR VIEW OF FLOWMETER HOUSING
(3 GAS MACHINE)

Figure 8: FLEX TUBING CONNECTIONS

INSTALLATION PROCEDURE (continued)

55. Reinstall the vapor box front plate using the hardware that was previously removed.

56. Connect the flex tubing between the OFPDs and the O_2 supply as shown in Figure 8. Tubing lengths are shown in the illustration. Use press-on hose clamps at the OFPDs and 4-way fitting, and tie straps at the nylon tee fittings.

57. Slide the flowmeter light PCB assembly (P/N 4107370) into the flowmeter light channel (P/N 4104739).

58. Locate the unused connector on the flowmeter lights wire harness. (It may be covered with tape.) Join this connector to the pins at the top of the flowmeter light PCB assembly.

    Orient the connector so that the black wire is at the front and the red wire is at the rear as shown in Figure 9.

59. Place the flowmeter light channel over the two spacers that were previously installed in the center channel.

60. Install the new flowmeter shield (P/N 4111830-001) by placing it over the flow control valves. Install the 3-gas knob guard with the screws that were previously removed from the old knob guard.

61. Reinstall the O_2 flow control knob and ensure that the "off stop" is set correctly.

62. Install the Air flow control knob. Set the "off stop" and install a yellow AIR label on the knob.

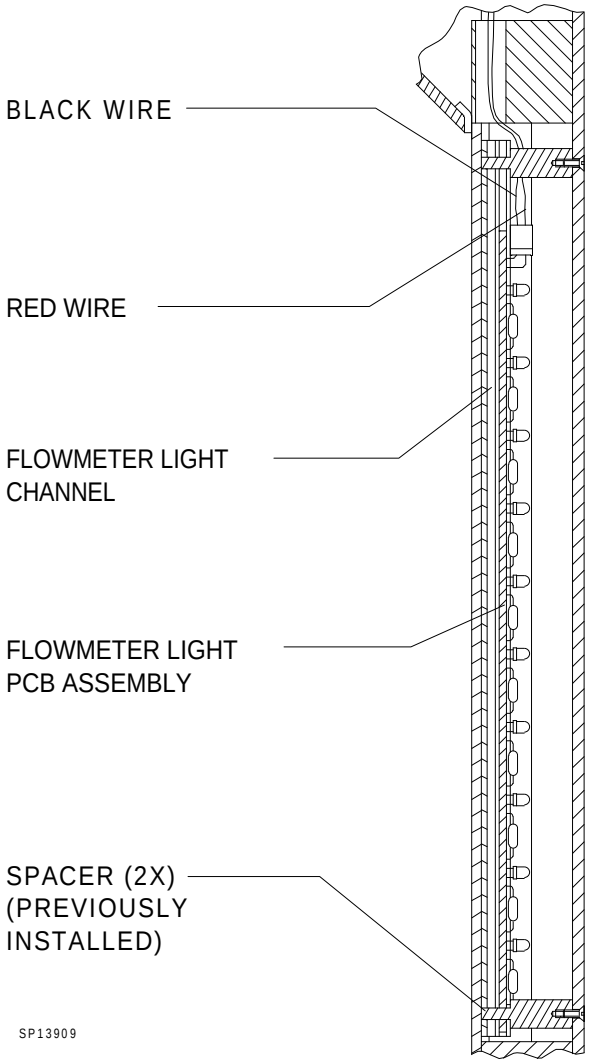


Figure 9: FLOWMETER LIGHT INSTALLATION

AIR CIRCUIT ADJUSTMENT AND TEST

Cylinder Pressure Regulator Adjustment

1. Remove the plug from the tee fitting in the air cylinder pressure regulator output line, and connect a test gauge (P/N S000063) to the tee fitting.

2. Attach an air cylinder to the air yoke on the machine.

3. Connect AC power to the machine and turn the System Power switch to ON.

4. Open the O_2 cylinder valve and set the oxygen flow rate to 4 l/min.

5. Open the air cylinder valve and set the air flow rate to 4 l/min.

6. The test gauge should indicate between 43 and 49 psi. If adjustment is needed, remove the acorn nut from the bottom of the regulator to expose the adjusting screw. Turn the screw to bring the pressure reading into the correct range. Replace the acorn nut.

7. Close the cylinder valves and allow pressure to drain from the system.

8. Close the flow control valves and turn the System Power switch to STANDBY.

9. Disconnect the test gauge and replace the plug in the tee fitting.

High Pressure Leak Test

10. Open the cylinder valves and allow the gauge pressures to stabilize.

11. Close the cylinder valves and observe the cylinder pressure gauges. The pressure should not drop more than 50 psi over the next two minutes.

Low Pressure Leak Test

12. Open the flow control valves.

13. Connect a test gauge and B.P. bulb to the freshgas outlet, and pressurize the system to 50 cm H2O.

14. The pressure should not drop more than 10 cm H_2O in thirty seconds.

15. Close the flow control valves and disconnect the test gauge.

OFPD Test

16. Turn the System Power switch to ON.

17. Open the O_2 and the AIR cylinder valves.

18. Set the oxygen flow rate to 2 l/min., and the air flow rate to 2 l/min.

19. Close the O_2 cylinder valve. When the oxygen flow stops, the air flow must also drop to zero.

AIR CIRCUIT ADJUSTMENT AND TEST (continued)

Flow Test

20. Connect all pipeline supplies and open all cylinder valves.

21. Turn the System Power switch to ON.

22. Verify that the O_2 minimum flow is 175 ± 25 l/min.

23. Verify that O_2 is able to flow throughout its full range.

24. Set the O_2 flow to 4 l/min.

25. Verify that the other gasses are able to flow throughout their full range.

26. Close all flow control valves.

27. Fully open the N_2O flow control valve, and record the N_2O flow rate.

28. Close the N_2O flow control valve.

29. Set the O_2 flow to 10 l/min., and set the N_2O flow to 10 l/min.

30. Gradually close the O_2 flow control valve until the N_2O flow rate is the same as in Step 27. At this point the O_2 flow rate should be within 250 to 400 ml/min. If the O_2 flow rate is outside this range, perform an ORC adjustment and repeat the test.

Oxygen Concentration Test

31. Turn the System Power switch to ON.

32. Connect a 12 inch 22 mm hose to the inspiratory valve.

33. Set the Man/Auto selector to BAG.

34. Close the APL valve.

35. Occlude the bag mount.

36. Calibrate the O_2Med and insert the O_2 sensor housing into the valve dome adapter on the inspiratory valve.

37. Press the O_2 Flush button for 15 seconds.

38. The O_2Med shall read 97-100% within three minutes.

39. Set the oxygen flow to 4 l/min, and the AIR flow to 2 l/min.

40. The oxygen concentration shall be 71-77%.

41. Close the AIR flow control valve.

42. Set the N_2O flow to 2 l/min.

43. The oxygen concentration shall be 64 - 70%.

44. Close the O_2 and N_2O flow control valves.

AIR CIRCUIT ADJUSTMENT AND TEST (continued)

ORC Test

45. Press the O_2 Flush button for 15 seconds.

46. Set the oxygen flow to 1000 ml

47. Open the N_2O flow control valve to its stop position.

48. The oxygen concentration shall be 22 - 28%.

49. Adjust the oxygen flow to 1.5 l/min.

50. The oxygen concentration shall be 22 - 28%.

51. Adjust the oxygen flow to 2 l/min.

52. The oxygen concentration shall be 22 - 28%.

53. Adjust the oxygen flow to 4 l/min.

54. The oxygen concentration shall be 22 - 28%.

55. Close the oxygen flow control valve.

56. The oxygen concentration shall be 22 - 30%.

Re-Assembly

57. Close the cylinder valves and drain the pressure. Turn the System Power switch to STANDBY.

58. Reinstall the table top.

59. Reinstall the flowmeter housing back cover.

60. Perform a complete PMS procedure on the machine.

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